# 7.5 Biological Control Program

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The Biological Control Program was established in 1999 in response to a DOE inquiry (DOE-RL 98-EAP-58) into increasing incidents of radioactive contamination spread by biological vectors. A biological vector is a plant or animal species (including arthropods) that is involved in the transport of radioactive contamination. A common Hanford example is the tumbleweed, whose taproot may transport radionuclides from below the ground surface into aboveground plant tissue, making it available for dispersal across the site by wind or other means.

Biological control (or often simply "control") is any activity to prevent, limit, clean up, or remediate the impact to the environment, or human health and safety, from contaminated or undesirable plants or animals. The radiological component includes activities to control the spread of radioactive contamination. The nonradiological component includes activities to control pests (e.g., noxious weeds) that may affect the workplace and to ensure compliance with federal, state, and local laws. The Biological Control Program is responsibile for integration of 1) expanded radiological surveillance, 2) control of plants and animals, 3) cleanup of legacy and new contamination, and 4) restoration of sites effected by radioactive contamination spread by plants and animals.

Biological control of industrial weeds, noxious weeds, and pests have similar methods of prevention and response. Because the methods may overlap, nonradiological control of biota also was integrated into the new Biological Control Program. Industrial weeds, i.e., weeds on industrial sites such as Hanford, are not only a nuisance but also cause fire hazards and reduce the efficiency of men and machines working in the area. Occasionally, the objective of an industrial weed control program is to totally eliminate vegetation in the effected area. On the Hanford Site, the control of industrial weeds occurs at tank farms, pumping installations, industrial sites, transmission lines and stations, buildings, storage and work areas, and along fence lines. Noxious weeds are discussed further in Section 7.5.2, "Noxious Weed Control." Animal control prevents, limits, or removes undesirable animals through the application of chemical, cultural, or mechanical methods.

Biological control may include preventive measures or measures in response to existing contamination spread. Important activities to prevent the spread of contamination include surveys of the ground, vegetation, and flying insects; preventive controls, such as herbicide spraying; and the placement of engineered biological barriers. If plants or animals have spread radioactive contamination, typical response measures may include posting the area with radiation signs and stabilizing the contamination to keep it from spreading farther, followed by cleanup and removal of the contamination to an approved disposal location.

In some cases, remediation following the contamination cleanup and removal is necessary. Remediation is a common activity on the Hanford Site, but has specific meanings and limitations when applied to biological control. Remediation may include soil removal and replacement, revegetation

of soil surface, or placement of engineered barriers to stop biological intrusion (biological barriers). Such remediation is typically performed where there is a potential for surface contamination or infestation problems to recur, with the objective of preventing recurrence.

## 7.5.1 Biological Control in 1999

There were no incidents of offsite contamination by plants or animals in 1999, and all reported cases of new contamination on the site were cleaned up or scheduled for cleanup. In all areas of biological control, access to contaminated sites by professional control and cleanup crews improved in 1999. Facilities were able to request cleanup support without waiting to obtain contracts or set up work orders. Professionals were able to identify and treat problem areas without waiting for facility management to request or approve assistance.

During 1999, flying insects were routinely monitored on the Hanford Site and three contaminated houseflies were captured at a transfer facility in the 200-East Area. The source of the contamination was identified and sealed within two days. The contamination was then cleaned up and surveillance of the cleaned sites, as well as of flying insects, was conducted weekly until it was evident there were no additional problems.

In 1999, 86 incidents of contaminated vegetation were identified. This is an increase of ~80% compared to 1998. However, the increase is likely due to aggressive work by surveillance/cleanup teams to discover the contamination, rather than the creation of newly contaminated sites. During 1999, ~11,400 acres were treated with herbicide to control undesirable vegetation compared to 4,000 acres in 1998. Herbicide effectiveness in 1999 was ~85% compared to ~65% in 1998. Approximately 100 acres including ~2 miles of posted roadways were cleaned of windblown tumbleweeds and the roads opened. On the Hanford Site, ~5 acres were reseeded with native vegetation to prevent the growth of tumbleweeds.

In 1999, there were 5,500 animal control responses and 14 contaminated animals detected, a decrease of ~65% compared to 1998. The control of rodents around the perimeter of the Hanford Site used ~750 traps/bait stations compared to ~400 in 1998. There were decreased areas for animals to hide/live because of increased effectiveness of vegetation control.

## 7.5.2 Noxious Weed Control

Noxious weed control on the Hanford Site was developed in response to federal, state, and local laws requiring eradication or control of noxious weeds. Developed in an effort to satisfy agreements made in the federal interagency memorandum of understanding (1994), the noxious weed control program has been designated as a model for other DOE sites.

The four counties surrounding the Hanford Site (Adams, Benton, Franklin, and Grant Counties) have noxious weed control programs to protect their important agricultural industries, native ecology, and other interests. The Hanford Site is viewed with great interest and concern as a potential source for invasion of noxious weeds into these counties (Nature Conservancy 1999).

### 7.5.2.1 Background

According to the Revised Code of Washington, a noxious weed is any plant which when established is highly destructive, competitive, or difficult to control by cultural or chemical practices (RCW 17.10.010). Typically, noxious weeds are nonnative

(alien) species that invade and displace native species, reduce habitat for fish and wildlife, and contribute to the extinction of sensitive species. These are often plants that form unnoticeable components of their native communities, but have become aggressive invaders in new environments and can overcome native species. Noxious weed control is essential to preserve native ecosystems and wildlife habitat in some areas of the Hanford Site.

Priorities for control of noxious weeds on the Hanford Site are based primarily on 1) the potential for a weed species to spread and cause ecological damage, 2) the potential for a weed species to spread into radiological control areas and serve as a biological vector of contamination (take up stabilized underground radioactive elements and bring them to the surface), 3) the potential for a weed species to cause financial harm to neighboring landowners, and 4) cooperation and coordination with the control activities of neighboring counties and weed managers.

Planning and field control for the noxious weed program at Hanford is closely coordinated with the Washington State Department of Agriculture and Adams, Benton, Franklin, and Grant Counties. Weed control plans and progress of ongoing field activities are reviewed in quarterly meetings. Other agencies and groups attending the quarterly meetings and assisting in the technical review of the program include Washington State University Agricultural Extension Service, U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, U.S. Bureau of Reclamation, and South Columbia Irrigation District.

## 7.5.2.2 1999 Noxious Weed Control

Nine plant species are on a high-priority list for control at the Hanford Site. These species are listed below, with a summary of the 1999 control activities.

Yellow starthistle (*Centaurea solstitialis)* is the most rapidly expanding weed infestation in the western United States. Hanford is at a critical point in the infestation cycle. Over 1,200 hectares (3,000 acres) of the site have been heavily infested, and a large seed bank has been established in the soil. Many additional acres have scattered starthistle infestation. In the absence of control, starthistle will take over additional acres in the next few years, multiplying the size of the current infestation. Pioneer populations have begun in areas widely separated from the main infestation. Pioneer populations are infestations of noxious weeds that have established in areas away from the main infestation, and not previously infested by the species. These populations usually expand rapidly in size and serve as seed sources for even wider distribution.

Efforts to control yellow starthistle were concentrated in two major areas in 1999: 1) monitoring and spot treatment (as necessary) of pioneer populations and 2) aerial application of herbicides near the Old Hanford Townsite. Known locations of small infestations were treated with herbicides in 1998, and control from these applications remained effective through the 1999 season. Sites of previous infestation were monitored and plants that escaped treatment, or germinated near treatment sites, were destroyed by hand pulling or chemical treatment. Approximately 880 hectares (2,200 acres) were treated aerially in 1999. Control from this application was effective. Control also remained effective over the ~320 hectares (800 acres) that were aerially treated in 1998. Between the two applications, the major infestation of yellow starthistle was controlled in 1999. Considerable effort was made to treat plants growing near trees and along the Columbia River where aerial applications were not made.

Over a very large area, 100% eradication of weeds is not possible to achieve over the short term. Nevertheless, control of yellow starthistle was highly effective in 1999. Preliminary observations

indicate that controls will remain effective through the 2000 growing season. These effective controls will allow resources to be concentrated in fiscal year 2000 on areas where individual weeds are widely scattered, making aerial application impractical.

Biological control organisms have been released in the major population of yellow starthistle over the past 3 years. As chemical controls reduce the number and size of populations, it is hoped that biocontrols will assist in reducing seed production in scattered plants and isolated populations.

Rush skeletonweed (*Chondrilla juncea)* is widely scattered across the Hanford Site. It is the dominant or codominant species in four populations of one or more acres on the site. Additional plants or small plant patches are scattered across the site. Each of the four large populations of skeletonweed was treated with herbicide in 1999. Additionally, approximately two-thirds of the area known to harbor scattered skeletonweed plants was surveyed, and the plants were treated with herbicide as they were located.

Rush skeletonweed has a deep, extensive root system and minimal leaf area. These characteristics make it very difficult to control. Although initial chemical control of individual plants has appeared very effective, sprouts from deep roots that were not killed by the herbicide occasionally appear at the surface within 2 to 3 years following treatment. Treated skeletonweed populations are monitored for several years to identify and re-treat sprouts before the plants fully recover from previous control efforts.

Biological controls for rush skeletonweed have been introduced at Hanford. Effectiveness of controls varies widely from population to population and from year to year. In 1999, as in most other years, some populations were highly affected by the biocontrols and flowering was eliminated. Other populations were less affected and some were not significantly impacted by the biocontrol agents. On the Hanford Site, biocontrol agents available for rush skeletonweed rarely, if ever, prove lethal to the plants. Nevertheless, under good conditions, individual populations can be prevented from flowering and setting seed under conditions favorable to the biological controls.

Babysbreath (*Gypsophila paniculata)* is also found on the Hanford Site. Babysbreath is difficult to control and efforts continued in 1999. Treatment used at Hanford has effectively killed the aerial portions of the plants, even though a high percentage of the roots remain viable. By killing the aerial portion of the plants, flowering is prevented, eliminating seed set in treated plants.

Although many roots remain viable after treatment, destroying the leaves and stems curtails photosynthesis, preventing plants from storing energy reserves for winter and spring sprouting. Plants not killed by the treatments have been weakened. With consistent, follow-up treatment, it is expected that the plants will ultimately be weakened to the point of death. The babysbreath invasion is relatively small, and control by attrition is a practical alternative.

Dalmation toadflax (*Linaria genistifolia ssp. Dalmatica)* has been found in four populations on the Hanford Site. Three populations were treated in 1998 and monitored in 1999. No evidence of resprouting was found. A larger population was identified near the 100-B,C Area and treated in 1999. Monitoring will continue at all sites. Any resprouting or new plants will be treated immediately.

Spotted knapweed (*Centaurea maculosa)* has been identified in five populations on the Hanford Site. All were monitored in 1999, and control took place at three populations where live plants were identified. Spotted knapweed is a prolific seed producer and seeds remain viable in the soil for 10 years or more. All populations will be monitored in subsequent years to check for resprouting and follow-up control.

Diffuse knapweed (*Centaurea diffusa)* has become established in several locations on the Hanford Site and is rapidly invading and expanding in many areas. Invasion of this weed threatens much of the site. Major populations of diffuse knapweed were sprayed aerially with herbicide to reduce overall seed production. Diffuse knapweed is present as widely scattered individuals over several hundred hectares (acres) at Hanford. Considerable effort was made to locate and spot treat individual plants in the 100 Areas to prevent spread of the population. A special effort was made to treat roadways to prevent seed production. Vehicle traffic is a major vector for dispersal of diffuse knapweed. Isolated populations can serve as seed sources to infest large areas and were spot sprayed. By controlling these pioneer populations, relatively large areas can be kept free of knapweed. Diffuse knapweed is a prolific seed producer and seeds remain viable in the soil for 10 years or more. All populations will be monitored in subsequent years to check for resprouting and to coordinate additional control measures.

Russian knapweed (*Acroptilon repens)* was treated in a series of large test applications. Evaluation of herbicide effectiveness will take place in late spring of 2000. Subsequent applications will be adjusted based on findings from the 1999 test applications.

Saltcedar (*Tamarix spp.)* are found on the Hanford Site, south and west of the Columbia River. Several industrial plants remain from ornamental plantings around homes in the early part of this century. These plants are being controlled to prevent seed dispersal to sensitive habitats where uncontrolled populations may establish. A few populations are the result of natural seed dispersal; all plants were treated in 1999.

Saltcedar has an extensive root system that is very difficult to eliminate. Most plants on the Hanford Site have been treated for 4 years; however, some continue to sprout new growth. Monitoring and annual treatment will continue until saltcedar is eradicated.

Actively reproducing populations of saltcedar have also established on DOE-owned land north and east of the Columbia River. These lands are leased and managed by the U.S. Fish and Wildlife Service. An active program is in place by this agency, and the associated counties, to control saltcedar on these lands.

Purple loosestrife (*Lythrum salicaria*) were monitored in portions of Hanford's riparian areas in 1999. Two populations were identified and treated. Several immature plants were identified within the populations. Nonflowering immature plants are difficult to see, and therefore, often escape herbicide application. Follow-up monitoring and treatment will occur in the future. Populations of purple loosestrife at Hanford remain too small and diffuse for effective use of biological control organisms.